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ABSTRACT

Descriptions of models of the initial acquisition stages of reading development and of methods for teaching beginning reading are provided in this conference report which not only describes individual models and strategies, but also draws together and summarizes current thinking in this area. The models range from the behavioristic works of Thorndike and Skinner to the field of cognitive learning models of Singer and Gibson. Included in the latter are the linguistic theories ranging in outlook from attention to simple decoding to concentration on meaning of clauses and sentences. It is argued that a hierarchical structure of tasks does exist in reading, that it is possible to provide instruction at various levels of the structure, and that it is further possible to determine hierarchies from analysis of factors involved in reading behaviors. It was also argued that since different instructional procedures seem to produce their best results in one or two of several skill areas perhaps some attempts at matching methods to individual readers would provide the most successful reading instruction for all. A bibliography is included. (MS)

Theories, Models, and Strategies for Learning to Read

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Theories, Models, and Strategies for Learning to Read

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Although evidence has been accumulating for some time on the effect of various methods and strategies for teaching reading, only recently have models been constructed to represent the variables involved in reading and theories been formulated to explain the processes of decoding, comprehending, and encoding of printed messages (Holmes and Singer, 1964; Singer and Ruddell, 1970).

These models, as well as theories and research on cognitive, linguistic, and emotional-social development indicate that qualitative and quantitative changes in theoretical formulations and models of reading behavior are necessary for each stage of development (Singer 1965a, 1969; Athey, 1970). Consequently only those theories, models, and strategies that focus on the initial stages of acquisition of reading development are included in this review. First, we shall summarize methods of teaching reading, and then, in order, learning theories and strategies, linguistic theories, and finally, reading theories and models for learning to read.

Methods of Teaching Reading

In the history of American reading instruction (Smith, 1965), the unit of initial instructional emphasis has varied in a surprisingly systematic way from the smallest to the largest stimulus. At first, the unit of emphasis was the letter or alphabet method with its emphasis upon spelling

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procedures and its premium upon memorization processes for learning to read. Next on the continuum was phonics with its emphasis on letters or word parts (digraphs, blends, syllables, affixes), association of sounds with their printed counterparts, and premium upon auditory discrimination and pronunciation. Further on the continuum was the whole word as the stimulus unit, association between printed word and picture, and visualization as the primary mode of learning. Finally, and more recently, the other extreme of the continuum has been the sentence and paragraph or experience chart method as the initial stimulus unit with its stress upon meaningful context or experience of children, and the cumulations of expectancies and linguistic redundancies for providing for adequate stimulus input, clarifying meanings, and confirming word recognition predictions (Singer, 1966, 1968).

For some time the basal reading method dominated the American scene of reading instruction (Austin and Morrison, 1963). But, as a result of considerable experimentation in methods and media for reading development over the past ten years, the stimulus or input instructional unit now emphasized in American classrooms covers the entire continuum from the letter unit to the paragraph or whole story method.

This methodological continuum has been defined by Chall (1967, pp. 102-103) as varying along a dimension of emphasis with "coding" or stress upon word recognition at one extreme and "meaning" at the other. Programs which tend to start with synthetic phonics separately from connected reading define one extreme of the continuum. Next on the continuum are linguistic and modified alphabet approaches. Towards the meaning end of the continuum are intrinsic phonics programs which stress sight words and meaning. Closest to the meaning end of the continuum are programs which stress the "look-say" approach and emphasize

"thought" or meaning, but tend to teach no phonics, at least in the initial stages of reading instruction. Chall concludes that more emphasis in beginning instruction is needed towards the decoding end of the continuum.

However, regardless of the instructional method employed, the age-equivalent range of achievement in a representative heterogeneous classroom will still approximate two-thirds of the chronological age of the group, if all the children in the class are, in fact, reading at a level equal to their mental age expectancies (Bond and Tinker, 1967) Consequently the significant scientific and pedagogical question is not the often asked, but meaningless question of whether one method is better than another. Instead, the questions we might ask, are how do individuals learn to decode print to speech? What is the extent to which variations in method or initial units and sequences of instruction have to be adapted to individual differences in learners? What is the short and long range effects of differing input strategies upon the reading progress of various groups of children? The answers to these and other meaningful questions might enable us to increase the percentage of children who do attain expected progress in reading acquisition.

Although a multitude of questions on acquisition of reading ability

still need to be answered (Gibson, 1970), there are only two major classes of learning theories, stimulus-response and cognitive or field theories of learning, to draw upon in designing models for teaching reading.

Learning Theory for Teaching Reading

Stimulus-Response Models

Thorndike's model for reading instruction is based upon his stimulus-response theory of learning. Assuming that the unit of perception in learning to read is the whole word, Thorndike argued that learning to read depends upon acquisition of correct oral responses to printed words. All the teacher has to do then in teaching children to read is to expose each stimulus word to the pupil, identify its correct oral response, and upon subsequent trials or exposures of the printed word, provide for satisfying consequences for correct responses from the pupil.

For increasing the probability of obtaining satisfying consequences and also for utilitarian purposes, Thorndike reasoned that the most frequently occurring words should be taught first. This reasoning led Thorndike to construct his Teachers Word Book (Thorndike 1921, 1931; Thorndike and Lorge, 1944), which became the vocabulary source for almost all present day basal readers. Thorndike's theory of learning applied to reading instruction was also adopted as the basal readers' instructional rationale. Even the round-robin or reading-in-a-circle procedure widely used today in most first grade classrooms is based on the Thorndikian model for teaching reading (Singer, 1970a). Furthermore, his model is also used for teaching correct responses to constituent parts of words, such as occur in phonics and structural analysis skills in basal readers (Singer, 1971). Because the words used and ideas represented in basal readers are usually within the average first grader's vocabulary and experiential repertoire, oral responses or oral reconstruction of printed words is supposed to then

lead to association of meaning (Carroll, 1964), but can simply result in recoding of the printed message into an oral rendering.

Another S-R theory, Skinner's reinforcement of emitted responses theory of learning with its concept of shaping of behavior and its use of reinforcement schedules, has been employed by Staats (1965) to teach and to explain the acquisition of accurate responses to printed stimuli. Using an instructional apparatus based upon Skinnerian theory, Staats has demonstrated through careful control of frequency of input stimuli, extrinsic reinforcement of correct verbal responses by means of tokens for purchasing food or toys, and attention through reinforcement techniques to relevant stimuli in the learning situation, that children, even preschoolers, remedial readers, and delinquents, can be trained to respond accurately to printed words, at least in the initial stages of learning to read. Others, such as Ellson, et al. (1965) have conducted similar demonstrations with programmed instructional material and Moore (1961) has successfully adapted Skinnerian theory to a "talking typewriter," later called an autolelic or responsive learning environment, and has taught three-year olds to decode printed words.

Although Thorndikian and Skinnerian teaching models on a pragmatic level appear to be successful in the initial stages of reading, the assumption upon which they are based seems to be false. Children apparently do not perceive whole words at a glance in the initial stages of learning to recognize printed words. In fact, they tend to take on the average at least two fixations per words (Buswell, 1922).

Furthermore, Thorndikian and Skinnerian theories are quite limited in explaining and formulating research to discover new phenomena in reading. Implicit in both of these models is the narrow definition of reading that correct oral responses alone to printed words is reading. Even if these models were used to teach children according to the broadest definition

of reading, they would still be inadequate for explaining the acquisition of reading behavior because no attempt has been made in either S-R or Skinnerian theory to explain how and why the learner can acquire, organize, store, reorganize, formulate his own purposes, and mobilize appropriate subsystems for responding to the printed page (Singer, 1962, 1966) Of course, S-R theory can explain how individuals can learn to discriminate, abstract, and generalize, but S-R theory does not attempt to explain or predict the formation of conceptual systems. Essentially, then, the Thorndikian and Skinnerian models do not take into consideration the cognitive capabilities of the learner for acquiring, selecting, processing, organizing, and utilizing a repertoire of conceptual systems for actively responding to the printed page (Singer, 1966).

However, if the cognitive and affective capabilities of the human learner were added so that S-R theory became an explicitly formulated stimulus-organism-response or S-O-R model, perhaps using a mediational response concept (Woodworth, 1929; Osgood, 1953), hypotheses could be derived and tested to determine the conditions for developing the cognitive capacities of learners into an adequate conceptual system for reducing and processing the mass of detailed information necessary for responding accurately and meaningfully to printed words. Also, instructional conditions for developing and integrating the affective, conative, and cognitive systems of the individual might also be discovered and incorporated into S-O-R theory. Some research along these lines has already been conducted (Athey, 1965; Athey and Holmes, 1969; Davis, 1964).

For theoretical and educational purposes, merely developing accurate responses to printed words is not enough; theory and instruction must take the individual from correct responses to printed stimuli under extrinsic motivation to critical and creative reading performance under

intrinsic or curiosity-aroused motivation. This developmental transition from a conditioning or stimulus response mode to a cognitive mode of learning has been attributed by Holmes (1965) to the formation of "mobilizers," psychocatalytic mechanisms derived from the establishment of value systems and attitudes conducive to the realization of self-actualized goals and purposes in reading. These value systems are more likely to arise when individuals have been reared under conditions which have taught them to resolve their developmental, emotional conflicts in a positive direction of trust, autonomy, initiative, industry, and love (Athey, 1970).

Field or Cognitive Learning Theory Models

An active, purposeful and flexible mode of response to printed words can be developed from the beginning of formal reading instruction through field theories of learning which stress such concepts as purposeful behavior, knowledge of means-ends relationships, and various routes to goal achievement. Although not as systematically employed in instruction as S-R theories, field or cognitive learning theory models can be recognized in such approaches to teaching reading as the language arts and individualized reading methods.

Emphasis in the language experience method is on starting the learner with a meaningful sentence or paragraph based on his experience expressed in his own words, establishing purpose, developing expectancies for word recognition and meaning through the use of context, and then differentiating the paragraph into its constituent words and word elements. Through grouping of words with common elements, stress is placed upon having pupils learn to conceptualize or to discriminate, abstract, and generalize phoneme-grapheme correspondences, morphemes, spelling patterns, and other units consistent with rules of word recognition and with establishing a set for diversity (Levin and Watson, 1963) or flexibility in word recognition (Singer, 1966).

In essence, the language experience approach maximizes correspondence

of the printed message with the language of the reader; consequently, when he does read, his language competence system is activated, and his comprehension is therefore likely to be optimal (Ruddell 1965a, 1970). At first, the pupil learns to read his own words and then the words of others through an individualized reading program which features self-selection of books or satisfying the individual's curiosity as a motive for reading (Singer, 1965b).

Laboratory Investigations

In addition to experimentation based upon different learning theory models, laboratory investigations, using usually paired-associate types of learning, have been conducted. Under the more carefully controlled condition of the laboratory, albeit a somewhat artificial situation, some questions on learning to read have been studied.

Defining learning to read as decoding print to speech, Gibson divided the process into a sequence of three components: (a) discrimination of graphemes, (b) decoding letters to sounds, and (c) shifting from lower to higher order units or from phoneme-grapheme relationships to spelling patterns, clusters of graphemes in a given environment which have an invariant pronunciation according to the rules of English (Gibson, 1965; Fries, 1962).

Pick (1965) determined that discrimination of letters is initially learned through instructional emphasis upon discovery of attributes or distinctive features of letters by perceiving contrasting pairs of letters. Later, discrimination of letters occurs through the formation of schemas or prototypes, a kind of model or memory image of the letter, built up or stored as a result of repeated presentation of letters. Then, matching sensory experiences to the previously stored concept or model of the letter, the learner can correctly identify the letter.

Transfer seems to depend upon ability to relate oral sounds to graphic configurations at both initial and mature stages of reading. Bishop (1964) found that adults could learn to associate sounds to artificial words through repeating the sounds to the printed words without instruction in the component letter-sound correspondences, but transfer to new words depended upon learning letter-sound correspondences directly through instruction or indirectly by abstracting them in the process of responding to words. Samuels and Jeffrey (1966) reported that kindergarten children taught to recognize a group of words by a phonics method read more new words made up of the same letters, and learned the new word list significantly faster than the experimental look-say group, which performed in the transfer situation about the same as a control group. However, deaf children perform as hearing children do in utilization of pronounceable and unpronounceable spelling patterns (Gibson et al., 1970).

The size and complexity of higher order units, spelling and morphological patterns, increase with development of reading skill. Gibson, Osser and Pick (1963) compared first and third graders on tachistoscopic perception and spelling recall of pronounceable and unpronounceable trigrams made up of the same letters. The first graders performed better on the pronounceable trigrams, while the third graders did equally well on both, but not on longer four or five letter pronounceable pseudowords. The conclusion was reached that children at the end of first grade tend to read in short units, have already generalized certain regularities of spelling-to-sound correspondence, and by the third grade have increased their span of recognition to four or five lettered words, which involve more complex conditional rules and more complex clusters of spelling to sound correspondences.

In agreement with Fries (1962), Gibson suggested that discovery of these rules might be enhanced if reading materials were programmed

according to spelling patterns. Confirming this hypothesis, Skailand (1971) found that low socio-economic kindergarten pupils taught by spelling patterns recalled about twice as many syllables and words than those taught by whole words or single phoneme-grapheme patterns.

The order of ease of perception for words in isolation is first real words, meaningful and pronounceable according to spelling patterns, non-word pronounceable strings of letters, then meaningful but unpronounceable letter strings (Gibson, Bishop, Schiff, and Smith, 1964). But, Gibson (1965) wisely points out that the role of meaning probably increases in sentences in which semantic and syntactic constraints not only make sentences "memorable" and "intelligible," but also serve as "unit formers" for word perception. She is also cognizant that learning to read involves more than just learning three components; particularly, she notes that various strategies have to be evaluated and incorporated into instructional processes and decision-making.

Strategies in Word Recognition

Without guidance or stimulus control, children adopt the strategy of recognizing words by using the easiest cue, which may be an initial letter group, word shape, or any discernible attribute, even an idiosyncratic one or an incidental detail (Samuels, 1970). Pictures associated with words may hinder word recognition development under some conditions for poor readers (Samuels, 1967), but facilitate it under other conditions (Hartley, 1970). Perhaps pictures are useful in the initial stages of learning as a bridge from concrete to symbolic learning, but if not faded out may foster dependence. A developmental test of this hypothesis may be necessary to resolve the apparent discrepancy between Samuels' and Hartley's results. At least, Biemiller (1970) found that oral readers progressed through phases of dependence on context for

meaningful guesses, to no response, indicating awareness of graphic features of unknown words and inability to recognize them, and finally to increased skill in using graphic information and subsequently becoming able to integrate graphic information with syntactic and semantic constraints. Because some beginning readers may become too dependent on contextual and picture cues in the initial phase, Biemiller suggests that teachers should promote developmental progress by omitting contextual and picture cues and compelling children to rely upon graphic information as much as possible and adding contextual material as children acquire graphic skills.

Children can be taught to use a particular cue, but not necessarily a relevant one for transfer. For example, when color cues were used in teaching words, children learned to recognize color-cued words more rapidly than non-color cued words. But, when color cues were removed, the children had difficulty in recognizing the words; apparently they had not transferred the color cues to their associated word parts (Samuels, 1968). Samuels and Jeffrey (1966) also found that kindergarten children learned to recognize two letter-dissimilar words such as mi and so more rapidly than two letter-similar words, such as me and ma. But, in the transfer situation, the dissimilar group made more errors because they had learned and used only single letter cues. Thus, a strategy for speed of initial learning was not as effective as a strategy for slower rate of learning, but more effective transfer.

Although children learned initially to discriminate letters according to their attributes, the order in which the letters are taught makes a difference in rate of learning. Ackerman and Williams (1969) found that highly similar letters, such as b and d, were easier to learn to discriminate when taught successively. But for dissimilar letters, such as s and b, simultaneous discrimination training was easier. Ackerman

and Williams reasoned that similar letters presented simultaneously offered so many attributes at one time that acquisition of the discriminating attributes was hindered.

However, for flexibility in responding to printed stimuli when alternate responses are available for a particular grapheme, such as city and cow, concurrent rather than consecutive training is more beneficial. Williams (1968) reported that fifth and sixth graders in a modified paired associates paradigm could remember multiple correspondences for visual stimuli better when taught concurrently than consecutively. She inferred that readers who could identify graphemes as having multiple responses are more likely to switch to the alternate response when one proved to be ineffective in recognizing the word and are therefore more likely to be successful in reading the word.

Evidence on adult performance in word recognition cannot be generalized to the child beginning to read (Singer, 1970b; Williams, 1970; Samuels, 1970). Williams also points out that laboratory evidence on letters and words in isolation are inadequate because they have not included the linguistic constraints of semantics and syntax. When these linguistic components are included, then hypotheses or cumulative expectancies can be formed as a reader samples the printed stimuli that lead to predictions of words, word meanings, and ideas which are confirmed or disconfirmed by subsequent samples of stimuli (Hochberg and Brooks, 1970).

Questions of motivation on acquisition of reading behavior also need to be investigated. For example, what is the effect of locus of control and self-established goals upon reading acquisition and performance? In a case study, Singer and Beasley (1970) found when they gave a severely retarded reader the opportunity to set his own achievement

goal, restructured his learning conditions, for example, by switching from words read per minute to words read per session, so that through expenditure of the necessary effort he could always attain his goal, and provided for feedback and cumulative knowledge of progress, he spent increasingly greater periods of time on reading.

Further experimentation on intrinsic motivation must be undertaken, such as alternating, according to Piagetian theory, a period of assimilation of schemas or recognizing new words which fit under previously induced rules with a period of accommodation or introducing words which do not fit the rule, but instead require a new rule, perhaps a rule involving a high order unit, such as a shift from a phoneme-grapheme to a sound-spelling pattern. Or the shift may be from a graphic stimulus to a context plus a graphic stimulus, which is particularly necessary for determining pronunciation of homographs, such as "They produce food" versus "They take produce to the market." Resolution of such cognitive dissonance or reduction of uncertainty, as well as achieving word recognition expectancies determined by contextual and linguistic constraints, provides internal gratification and reinforcement. It also may establish a learning set for hierarchical organization. Furthermore, curiosity aroused by cognitive discrepancies may also foster active perceptual searching, and, if appropriate conditions are provided, result in rule-induction behavior.

Linguistic Models for Reading Instruction

Linguistic models for reading instruction also very on a decoding to meaning continuum. Towards the decoding end of the continuum, Bloomfield (1942) recommended teaching children first to associate regular spellings with their oral actualizations and then to progress gradually to irregular spellings. Fries (1962), pointing out that spelling patterns have a closer correspondence to oral language than do phoneme-grapheme

relationships, advocated teaching reading by presenting contrasting spelling patterns initially only in capital letters and associating the graphic forms with their oral responses.

Defining reading as only decoding print to speech, Reed (1970) argued that traditional phonics and whole word methods are both fallacious because phoneme-grapheme relationships are limited and the whole word method emphasizes meaning, which is not reading, but is a consequence of reading. Instead, Reed employs the hypothetical construct of linguistic form, which links a unit of meaning to a wholly regular physical representation of speech or writing, to explain that written and spoken symbols are associated through identification of their common linguistic forms. Learning to speak consists of acquiring linguistic forms at first through trial and error imitation and memorization and gradually through discriminating, abstracting, and generalizing the regularities in the grammatical and representational systems. For the child who has already learned to speak English, learning to read consists of associating graphic configurations with already known linguistic forms. Reed stresses that only after the child has learned to speak and write his own stock of linguistic forms should he be required to use reading to learn further linguistic forms.

Towards the meaning end of the linguistic models continuum, Chomsky's theory of transformational-generative grammar has been interpreted and applied to reading by several educational researchers, such as Goodman (1968) and Ruddell (1970). Goodman (1970) recently called for a translation of a theory of the reading process into a theory of reading instruction. In this theory, only sketchily presented, meaning is central and the basic unit of instruction is the clause. Because grapho-phonological, syntactical and semantic systems all interact from the beginning of

instruction, Goodman points out that sequencing of components is not possible, but control over materials is necessary. If the printed materials are consistent with the child's meanings and use of oral language, then the child should be able to use his linguistic competencies and constraints and redundancies of language for forming expectancies, predicting and confirming meanings; or, if predictions are not confirmed, utilizing strategies for self-correction. Consequently, the beginning reader must already be a competent language user and must have a need to understand printed communication. All of these processes operate as the reader selects cues, decodes graphic stimuli through the interaction of grapho-phonological, syntactic and semantic systems, and transforms the surface structure of the sentence to deep structure, tests the meaning and, if necessary, corrects initial "guesses." Then, when the meaning of the message is determined, encodes his own meaning through graphic or phonological rules for overt expression. Essentially Goodman's theory of instruction for reading is consistent with a field theory of learning and a language experience method of teaching reading.

Thus, like methods of teaching reading, linguistic implications for teaching reading range from emphasis upon decoding of print to speech to emphasis upon meaning at the beginning stages of reading behavior. The controversy involved in the continuum cannot be resolved by arguing that decoding to speech must involve meaning because it is possible to recode meaningless sentences from print to speech. Furthermore, as Goodman points out, it is possible to have a grammatical sentence without meaning, but it is not possible to have a meaningful sentence without grammar. Although the language competence of the beginning reader may be involved in instruction throughout the continuum, the models at the meaning end of the continuum are more likely to provide conditions of instruction for activating the language competence of the beginning

reader and these fac . his learning to read.

Whether the controversy needs to be resolved or not depends upon the answer to such empirical questions as the following: do the different theories lead to instructional procedures and consequences that facilitate or impede acquisition of reading ability? Are there differences in cognitive capabilities or styles of beginning readers that are more attuned to one approach rather than another? Some evidence on the effects of different instructional procedures in teaching reading can be adduced that may provide some insight into the issues involved in the controversy.

Methodological Effects on Reading Behavior

Although there is a hierarchy of skills in learning to read which start to develop at least as early as the child begins to talk, the evidence seems to indicate that training at the kindergarten or first grade level on tasks other than printed stimuli is likely to be less effective than on tasks which involve graphic stimuli. Gates (1926) reported that intercorrelations of perception of geometric symbols, numbers, and words were quite low. Yet, widely used in kindergartens today are materials purporting to prepare children for reading, but based on motor activities (Delacato, 1959; Kephart, 1960) visuomotor perception (Frostig, 1964), visual analysis and synthesis or "try" tasks (Manolakes et al., 1967).[1] Since perception is not a unitary function, and since there is likely to be little transfer from ability to perceive non-printed stimuli to printed stimuli, perceptual training for reading should focus on discrimination, abstraction, and generalization of printed letters and word forms (Singer, 1966, 1970b). Indeed, children apparently do learn some letter names during or prior to kindergarten. At least at the beginning of first grade, children can recognize most of the

[1] Try tasks 1 and 2 consist of visual analysis and synthesis of geometric objects. Task 3 uses letter tiles to reproduce words; this task, in contrast to Tasks 1 and 2, trains directly letter and word perception.

capital and at least half of the lower case letters (Hildreth, et al., 1965). Consequently, reading readiness testing and its related curriculum, normally begun in first grade, should probably be initiated sooner if children are in fact to be paced rather than forced or delayed in learning to read (Singer, Balow, and Dahms, 1968).

Individual differences in reading achievement at the end of first grade tend to be related to the method of instruction. Gates, Bond and Russell (1939, p. 41) found that the best variables for predicting reading progress in beginning reading were word recognition, ability to complete a partially told story, giving words which end with the same sound as an example, blending word sounds, ability to read letters of the alphabet, and ability to listen, understand, and make use of teacher's instruction. But, they emphasized that "if the teacher effectively emphasizes early phonetic attack, tests of blending, rhyming, etc., are likely to give higher correlations with reading progress in her class than in the teacher's class where less emphasis is placed on the phonetic approach."

Ruddell (1965b, 1968) discovered that programmed instruction was superior to basal or whole word approach on a standardized achievement test at the end of first grade, but at the end of second grade the basal reader approach turned out be superior. The explanation appears to be that the phonics emphasized in the programmed instruction taught the necessary word recognition skills needed for performance at the end of first grade. However, the more comprehensive set of skills taught by the basal reader and spread over a longer period of time did not pay off until the end of the second grade. Hence, in the initial stages of reading instruction, there are some general factors, such as language and thought which are common to a wide variety of reading tasks.

But, there is also a high degree of specificity. Consequently, performance in the initial stages of reading, in part, is a function of what has been specifically taught and emphasized (Singer, 1970a).

Apparently children in general can adapt to a variety of methods of instruction since each method tends to have its own set of effects. Buswell (1922), using an eye-movement camera for assessing symptoms of central mental processes in reading, compared results of a phonic method with a metho that emphasized meaning or content. The results indicated that the phonic method tended to promote left to right sequence and word pronunciation, while the meaning emphasis fostered concern for the content, but a slower degree of progress in word recognition and rhythmic eye-movement behavior or sequential reading.

Agnew (1939) reported that differences in methodological emphases resulted in differential effects in oral and silent reading. On word recognition and oral reading, the phonics-emphasis group was superior to the non-phonics emphasis group, but on silent reading, the two groups were about equal. These results suggest that the combination of abilities used or mobilized for oral reading placed a greater premium on a phonics subskill, but for silent reading a quantitatively and/or qualitatively different combination of subabilities was mobilized in which phonic abilities had less weight and other subabilities had greater weight.

A similar conclusion can be reached by careful reading of the largest methodological study ever undertaken in the United States. In this study, Bond and Dykstra (1967) compared five methodological emphases (initial teaching alphabet, basal plus phonics, language experience, linguistic, and phonics combined with linguistics) against a basal reader approach. For comparison criteria, they used word reading, paragraph meaning, spelling and word study skills, as assessed by subtests of the

Stanford Reading Achievement Battery. Although Bond and Dykstra recognize serious methodological flaws in the design of the First Grade Study, such as non-comparable samples, their findings at least suggest hypotheses for further research. In general, Bond and Dykstra found that the non-basal instructional program tended to be superior to a basal program when assessed on the criterion of word recognition skills at the end of the first year of reading. However, when non-basal and basal programs were compared on the basis of comprehension, the differences were less consistent. The program superior to the basals in development of word recognition skills, as assessed by Stanford "word reading" and Fry's phonetically regular and Gate's random sample of words, were i.t.a., basal plus phonics, linguistic, and phonics-linguistics, but not the language experience approach. The programs that were superior to basals in development of comprehension were basal plus phonics and phonics-linguistic programs. Apparently, more emphasis upon phonics and linguistic elements than usually encountered in a typical basal reader program and inclusion of meaning or connected reading enhances not only word recognition skills, but also comprehension.

From these results we can formulate the hypothesis that the various methods of teaching reading result in readers whose skills on the average are developed differently. In one method, word recognition skills may become initially better developed than word meaning, while in another program the results might be just the opposite. This inference would explain why in some of the First Grade Studies comprehension could still be equal, even though the subskills in the two programs were differentially developed. This hypothesis should, of course, be tested. If a longitudinal investigation could be conducted, using the six stimulus or input emphases or methods of teaching reading on comparable samples, then it would also be possible to test the hypothesis that differential inputs or methods of teaching reading result at least

initially in different models or general working systems for attaining speed and power of reading. If this hypothesis is tenable, the next question is whether the differences are lasting or whether convergence of the models tend to occur (Singer, 1968).

But, any method is not equally beneficial for all pupils. Bond (1935) and Fendrick (1935) in a pair of coordinated studies revealed some interaction between method of instruction and modality deficiencies. Children who had a visual handicap tended to achieve better by a phonics method while children with auditory defects tended to learn better by a look-say method. Thus, although children, in general, can adapt to various methods of instruction, some children benefit more when methods are adapted to the hierarchical mode and sequence in which they can learn best.

Hierarchy of Acquisition of Reading Behavior

As the learner progresses in reading acquisition, he builds up a hierarchical organization of subsystems (Holmes, 1965; Singer, 1965a). Gagné's (1965) hierarchical model for decoding can be defined as a logically organized input sequence based upon some laboratory evidence and the assumption that oral language development is a necessary prerequisite for acquisition of reading behavior.[1]

Gagné's initial input hierarchy terminates with words that conform to regular pronunciation. The hierarchy starts at the lowest level with reproduction of single letter sounds, an ability which is basic and underlies two branches, one concerned with speaking and learning reproduction

[1]Oral language development as a necessary prerequisite for acquisition of reading behavior may be an unnecessary assumption. Reed (1970) points out that deaf children can learn to relate at least some graphic configurations to linguistic forms before they have learned to associate oral expression to these same linguistic forms.

of orally presented single syllables and then multisyllabic words. The other branch is a hierarchy for symbol identification and consists first of learning to respond to printed letters by sound; then, pronunciation of single vowels or consonants and diphthongs and alternate phonemic values; next, blending two to three vowel and consonant combinations or syllables, and finally pronunciation of regular spelling patterns with different phonemic values. At the syllable and again at this point the two branches combine. In three more stages, the individual learns first to pronounce printed words composed of closed syllables, then to test cues to match oral reproduction with familiar oral vocabulary, and finally to read words based on regular pronunciation rules.

Later stages of reading consist of learning additional rules for irregularly spelled words. Comprehension, constituting another domain, consists of a series of intellectual tasks, which subsume predicting sequences of thought, detecting irrelevant ideas, formulating the main idea, and inferring meanings of unfamiliar words from context. These components of comprehension, according to Gagné, are learned by "practicing reading with a variety of subject-matter content." With greater facility in reading, the reader achieves speed by making better predictions and by sampling stimuli rather than responding to each printed word. Higher order rules pertain to longer units of discourse, such as paragraphs and chapters. All of the rules or principles are "typically learned" not by a deductive, but an inductive, discovery method from the act of reading. For various types of reading, the reader must develop particular rules, for example, literary standards for critically reading literature.

The basic assumption in Gagné's hierarchical organization of decoding behavior is that for ease of learning at each stage there is

a particular order of skills which must be acquired in the given sequence. Gagné believes that shortcuts in the hierarchy are accompanied by limitations in ability to generalize the acquired abilities. Learning of component parts of the hierarchy is consistent with his hierarchical order of learning in general, consisting of a conditioning type of learning of word sounds at the base and ending up with problem solving. Involved in this learning hierarchy are all the S-R and field theories of learning (Gagné, 1965).

Complementing Gagné's hierarchical organization of psycholinguistic components for decoding is an organization of mental structures and processes involved in word recognition (Samuels, 1970). The process for developing and using this mental organization starts with a printed stimulus. Through discrimination learning, the individual selects cues and develops responses to them which are stored in long-term memory. Subsequently selected cues go into short-term memory and are recognized through visual processes, perhaps in association with the auditory system. Next the cues enter long-term memory and then are read for "hook-up" with available responses and integrated or blended with previous responses to cues. Response availability may be facilitated through control of context and associative connections between words. Linguistic variables also affect systems involved in learning to read new words, but Samuels does not specify the linguistic variables nor the mental components or processes affected by them. Thus, when the reader has selected and recognized a cue, has the appropriate response available for pairing with the cue, has hooked-up the cue with its response, and blended it with previously paired cues and responses, he is able to recognize or say the word.

Encompassing Gagné's and Samuels' models, substrata-factor theory of reading (Holmes, 1960) postulates that underlying and supporting

each component of reading, such as speed or power of reading or underlying each factor, such as word recognition, or each system such as decoding, is a functionally organized hierarchy of interwoven neurological subsystems (Davis, 1964).. As an individual learns to read, he gradually develops interrelated subsystems and strategies for decoding, mediational processing, and encoding of responses to printed stimuli. As an individual's subsystems improve in variety, magnitude, and intercommunicability as a result of maturation, learning, and experience in mobilizing subsystems for responding to printed stimuli, he becomes more flexible in organizing and reorganizing his subsystems.

The developmental hypothesis of the theory has been confirmed at the intermediate grade level (Singer, 1965a). Although evidence at the primary grade level appears to consistent with the hypothesis that different input sequences of instruction will have differential effects upon the acquisition of a hierarchical structure and its relationships for reading, the hypothesis still needs to be tested at this level.

Besides determining the substrata-factors resulting from different input strategies for teaching reading, another question that needs to be answered is whether the various input sequences on the continuum from decoding to meaning eventually result in the same or in quantitatively and/or qualitatively different subsystems for reading. It should also be possible to determine statistically whether one input as compared with another input sequence provides an "initial kick" (Holmes and Singer, 1961) that results in a cumulative advantage in reading performance. Further investigation is also needed to determine whether children with different cognitive styles (Tyler, 1969) or ways of perceiving stimuli benefit more from one input strategy than another.

These three sequential models can be conceptually integrated into one stimulus-organismic-response model. Gagné's model emphasizes a logically-determined input hierarchy; Samuels' implicit model stresses the organismic components and processes involved in learning and decoding print to speech. Substrata factor theory, utilizing a statistical procedure for testing hypotheses and for constructing performance models, emphasizes the hierarchical subsystems that can be mobilized in response to the purpose of the reader and the demands of the task-stimuli. This integration, of course, can be empirically tested through a longitudinal investigation at the primary grades by using Gagné's model for determining an instructional input sequence and substrata analysis for empirically constructing the resulting performance model for decoding print to speech. Correspondence between the input sequence and the performance model would tend to confirm the integration of the two models.[1]

Summary and Conclusions

Beginning reading instruction in the United States varies along an historically related methodological continuum from emphasis upon decoding print to speech at one end of the continuum to stress upon meaning at the other end of the continuum. The methods involved in this continuum can be categorized into one or the other of the two major classes of learning theories, stimulus-response and cognitive or field theory models.

Methodological and instructional models have tended, at least in

[1] Other integrations, such as Spache's input sequence based upon Guilford's structure of intellect model and Barrett's comprehension model based upon the taxonomy of educational objectives, could be similarly tested (Singer, 1970b).

the initial stages of reading acquisition, to result in quantitative and qualitative differences in reading performance. Laboratory investigations of reading acquisition have also discovered variations in performance as a consequence of instructional procedures, such as speed of initial learning with little or even negative transfer to a slower rate of learning to recognize printed words but with more positive transfer.

Major components of learning to read have been identified as letter discrimination, decoding to speech, and shifting of perceptual units from phoneme-grapheme relationships to higher order units or patterns that also have an invariant relationship to speech. However, evidence for learning these components, based on laboratory investigations in paired-associate type learning paradigms, is susceptible to modification when the components to be learned are put into sentence context in which syntactic and semantic constraints and redundancies inherent within normal language can function.

Linguistically derived models for the initial stage of reading instruction also vary in emphasis along a continuum. Learning to relate graphic and speech representations of linguistic forms in isolation constitutes one extreme of the continuum. At the other extreme, meaning is emphasized by teaching the child to decode at first graphic representations of his own language, which necessarily involves grapho-phonological, syntactical, and semantic systems for transforming surface to deep structure, testing meaning, and if confirmed, encoding it for overt expression. Although the language competence of the beginning reader may be involved in instruction at both ends of the continuum, the transformational-generative grammar-determined model, which explicates the structures and processes underlying performance in reading, is more likely than models

towards the other end of the continuum to provide conditions of instruction for activating the language competencies of the beginning reader and thus facilitating his reading.

As the learner progresses in reading acquisition, he builds up a hierarchical organization of subsystems. Three models were identified with this hierarchical reorganization and can be conceptually integrated into a stimulus-organismic-response model for learning to read.

Much more research and theorizing needs to be done at the learning to read stage before learning theories and strategies, linguistically-determined units and sequences of instruction, and psychological theories for explaining input, mediational processing, and output response systems can be integrated into a comprehensive theory of instruction. Such a theory would also have to encompass differences in cognitive or perceptual learning styles and decision-making, criteria for determining strategies for achieving various sub-goals in teaching reading, such as a rapid rate of initial success with little transfer versus a slow rate of initial success with a maximum degree of transfer.

Steps towards a comprehensive theory of instruction for teaching reading have already been taken by some researchers, such as Goodman (1970), Coleman (1969), and Bormuth (1969). As theory or theories of instruction develop further, we will be much closer to our ideal of adapting methods and materials to each individual. Consequently, we will then perhaps be able to transform a slogan into a reality, the right of all children to learn to read.

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